STATEMENT OF WORK
FOR

Lifting Devices and Equipment Manager
Training Modules

1. **BACKGROUND:** NASA Langley Research Center (LaRC) plans to develop a series of training modules for new Lifting Devices and Equipment Managers (LDEMs) to be used across the Agency. LDEMs at each NASA Center or Facility are responsible for implementation and enforcement of Federal regulations, and Agency and Center or Facility regulations, policies, and procedures for lifting equipment and operations, including many industry consensus standards as required by Federal regulations (OSHA). While individual Center or Facility procedures and process may vary in the implementation of the requirements, all NASA installations are required to comply with the Federal and Agency regulations. These requirements include but are not limited to equipment such as mobile cranes, overhead cranes, hoists, winches, mobile aerial platforms, powered industrial trucks, jacks and rigging hardware and their operation. Training Modules developed by this effort are not intended to include the individual installations' exact procedures and processes, but to identify and explain the responsibilities, roles, and requirements of the LDEM and the overarching program requirements.

   LaRC is seeking training program development expertise over a 120-day period to develop and submit a series of training modules for LDEMs (especially those new to the position or with limited prior exposure to the skillsets and capabilities required to effectively manage a Lifting Program and to all areas of design, operation, and maintenance of lifting equipment), their staff, and those working with them to ensure the safety of lifting operations and equipment throughout the Agency.

   Safety, facility engineering, and project/program personnel involved with lifting operations (critical and non-critical), oversight and/or installation or modification of lifting hardware or equipment may also benefit from this course.

2. **OBJECTIVE:** Ensure the safety of NASA lifting operations by helping new and less experienced LDEMs understand their roles, responsibilities and authority with respect to lifting operations, the programs, and overall NASA community. The course will assist in the integration of new LDEMs and alternates into their positions and assist in sustaining continuity through changes in LDEM assignments, standards, practices, and governing documents. A major intent of this training is to demonstrate why the knowledge is important, not just a presentation of requirements.

3. **SCOPE OF WORK:** Develop a series of 9 computer web based training modules to introduce LDEMs to fundamentals of the Agency's lifting program with a major component of this course being the development of a thorough understanding of the roles and responsibilities of the LDEM. The LDEM will gain an understanding of the applicable Federal, Consensus and Industry safety standards as they apply to Lifting Devices and Equipment (LDE) operations and in particular the NASA specific/unique requirements, training programs and requirements, needs for inspection and testing, certification, record keeping, applicability, categories of lifts, and an introduction to types of equipment. Equipment covered includes mobile cranes, overhead cranes, hoists, rigging hardware, aerial work platforms, powered industrial trucks, hydra-sets and load measuring devices, hoist supported personnel lifting devices, and jacks.

   A preliminary/draft outline of the training program is included as Appendix A.

4. **DATA / DELIVERABLES:** The Contractor shall design, develop, and deliver Interactive Multimedia Instruction (IMI) Distance Learning (DL) courseware for NASA in incremental phases including: Storyboards, Beta Product, and Final Product using Microsoft PowerPoint or equivalent.

   The courseware will offer a pretest in order to measure the learner's current knowledge level of the subject matter. Additionally, the courseware will help the learner assess their comprehension and retention of content during the module. A posttest will provide an opportunity to assess the learner's command of the content. Learners will receive immediate feedback and remedial training to enhance and reinforce learning.

   All lessons will be evaluated at the storyboard and IMI stages. Each storyboard and iterative e-Learning module deliverable will receive internal and Government reviews of both technical content and presentation.

   The Government has unlimited rights to all deliverables of this Order.

5. **GOVERNMENT FURNISHED EQUIPMENT / INFORMATION:** The government will provide an electronic copy of NASA Standard 8719.9 Standard for Lifting Devices and Equipment and NPR 8715.3C NASA General Safety Program Requirements under this contract. Information relating to how and with whom the LDEM interacts, and how the LDEM does his job, gets funding, informs the Center management of risks, program needs, etc. will be provided at the kickoff meeting at the beginning of the contract.

6. **TRAVEL:** The Government Technical Monitor will travel to the Contractor's place of employment for a period of 2 days at the beginning of the contract to assist in a kickoff of the task and to collaborate on the training program.

7. **DUTY INFORMATION:** The place of performance and period of performance:

   a) **Place of Performance:** The kickoff meeting and initial collaboration will be held at the contractors place of business for a period of 2 days. Development of the training program will be at the contractors place of business with conference calling between the contractor and the NASA technical point of contact available as required.

   b) **Period of Performance:** The period of performance is 120 days with the final review and acceptance of the training modules conducted over a period of 10 work days following the final submittal.

Appendix A
Preliminary / Draft Course Outline

1) Introduction

a) Agency Requirements: NPR 8715.3C NASA General Safety Program Requirements and NASA-STD-8719.9 Standard for Lifting Devices and Equipment.

b) Center Procedure: Each Center is required to have process and procedures to implement Agency requirements effectively. Specific process and procedures may be unique to each center.

c) The magnitude of Lifting Programs
   i) 13 Centers and component facilities
      (1) Some centers with hundreds of lifting devices and thousands of hardware items
      (2) Lifting operations vary from routine maintenance and delivery truck unloading to lifting of space craft
      (3) Budget challenges
      (4) Each Center has unique applications, needs, and facilities but personnel are subject to the same Agency requirements and have similar challenges
      (5) Means of implementation of Agency requirements and OSHA regulations can and probably should vary from Center to Center (though compliance is required)
   ii) Civil Service operators
   iii) Contract operators
   iv) On-site contractors, many with independent tracking/testing systems
   v) Offsite Contractors inclusion by contract, particularly flight hardware and operations
   vi) Applicability to Construction Contracts

d) Video of lifting equipment failures and consequences to illustrate why the ensuing modules are important; not alarmist, but showing examples, with explanations, of what could happen, briefly how, and consequences.

e) Keeping personnel, equipment, and assets safe requires:
   i) Proactive application of your knowledge and experience in all of the following areas:
   ii) Awareness and vigilance
   iii) Knowledge of equipment in general
   iv) Knowledge of what equipment you have at your Center
   v) Knowledge of engineering, codes, and standards
   vi) Knowledge of rigging and handling
   vii) Managing the Lifting Program in accordance with the Agency requirements
   viii) Involvement in Center Processes for review and approval of new and modified lifting systems and procurement activities for new hardware
   ix) Involvement in procurements that may involve significant use of lifting equipment
   x) Developing and maintaining credibility and contacts with personnel involved in lifting operations
   xi) Maintaining an appropriate training program that is kept up to date with industry advances and changes

f) Organizational Structure
   i) Location: LDEMs location in organizational structure varies by center, including Safety, Engineering, or Facilities and other locations
      (1) Location is less important than management support, resources, and independence (ability to do the right thing regardless of where in organization the LDEM is located)

(2) The Agency requirements for safe operations are the responsibility of the Office of Safety and Mission Assurance regardless of where the center delegates the LDEM responsibility, and the Center Safety organization must be involved at some level, however primary responsibility for safety of each employee rests with that employee and his/her supervisory chain
(3) Allowing an organization to abdicate responsibility for safety by saying that the LDEM is responsible is not appropriate or effective – the most effective program will involve the LDEM informing the owners/users/operators and Center management of their responsibilities, helping them to understand how to meet them as efficiently as possible, and ensuring that those entities fulfill their responsibilities

g) Resources
   i) An effective program requires sufficient resources to accomplish what is needed, but there are many ways to achieve the results
   ii) Funds may come from Center CM&O funds, program or project funds, or combinations of both. Funding is each Center's responsibility and there is not an Agency budget line item for this area.
   iii) Lifting Devices Program staffing may be civil service or contract, dedicated or matrixed, but the LDEM position itself as defined in the requirements documents is a government civil service position
h) Responsibilities
   i) Manage the installation lifting program (brief description here, covered in detail in next module)
   ii) Advise center personnel on appropriate methods and materials to accomplish goals and tasks in the lifting program
   iii) Critical Lifts vs Non-critical lifts
      (1) Determination
      (2) Procedures
      (3) Equipment
      (4) Personnel

2) Roles and Responsibilities

a) See NASA STD 8719.9 for details
b) Program Management
   i) Be knowledgeable of and confident in your understanding of the Agency requirements document and any Center process and procedures
   ii) Help your customers/users to perform safe, compliant, reliable lifts
   iii) Inform the customer (system owners / operators) of program requirements, give technical value in how to achieve compliance and safe design and operations, and how to avoid later costs and schedule impacts for replacing unacceptable components or because of non-compliant (and therefore unusable without a waiver) equipment.
   iv) Outreach – Inform known and potential equipment owners / operators of program, Agency, and Center requirements. Make certain that they know that you are available not only for enforcement of requirements, but also to assist them in safely, efficiently, and reliably accomplishing their lifting responsibilities.
   v) Manage the Center Lifting Program to include all systems that must be in the program, ensure appropriate documentation and Configuration Management, ensure that certifications are scheduled and tracked, etc
   vi) Provide your user the information needed to make responsible decisions for the benefit of NASA

vii) Interpretations of standards and requirements
viii) Learn how funds are allocated for this type of function at your Center
ix) Be proactive
x) Be involved in all LDE procurements
xi) Know what budget is required (develop budgets sufficient to accomplish program needs)
xii) Ensure Center funding mechanisms are in place and supported by Center Leadership
xiii) Interact with and inform Center Management as necessary and appropriate Tell management the truth about center system status and risks
xiv) Communications with NASA HQ OSMA and other LDEMs
xv) Revisions to NASA Agency policy and requirements
xvi) Dealing with OSHA
xvii) Assess and respond to requests for waivers/variances as appropriate, ensuring Center Management understands the implications and risks of granting requests
xviii) Conduct and lead the Center's Lifting Device and Equipment Committee
xix) Review and approve as appropriate documents, including critical lift determinations and procedures
xx) Be able to act competently as the Technical Authority for all lifting program requirements, and as the authority having jurisdiction under exclusive federal jurisdiction when industry, state, and Center regulations do not apply
xxi) Perform Center self-audit periodically to verify program is resulting in safe, reliable, and efficient lifts
xxii) Verify that the Center procedures are being implemented as designed and documented, and modify the procedures as needed to ensure safe, reliable, compliant, and efficient lifts

c) Engineering
   i) Knowledge and capability provided by either LDEM or support staff
d) Operations
   i) Knowledge and capability provided by either LDEM or support staff
e) Program Maintenance
   i) Scheduling
   ii) Cost
   iii) Testing and inspection requirements
   iv) Configuration control requirements (tracking and tagging)
f) Initial LDEM training to be competent and continuing education (formal, informal, reading) to upgrade, enhance, and maintain capabilities is essential

3) Codes and standards

a) Regulatory Requirements (Legal requirements, externally imposed)
   i) Federal
      (1) OSHA is mandatory
      (2) Deviation from OSHA requirements requires submittal by the Designated Agency Safety and Health Official (at NASA HQ) of an Alternate Standard in accordance with 29 CFR 1960.17 (so other than for suspended load operations, for which NASA has an Alternate Standard, any waiver of OSHA regulations is going to take a long time) (and even suspended load operations procedures must be submitted to OSHA)
      (3) Department of Transportation
   ii) State
      (1) Cal-OSHA (where applicable – Federal installations are not required to follow)
b) NASA Agency requirements
   i) NASA-STD-8719.9

c) Other Agency Requirements
    i) Air Force Range Safety (Not legal requirements, but they can stop launches from their ranges)
d) Industry Consensus Standards
    i) ASME B30 series
    ii) ANSI
    iii) etc
e) Industry Design Standards
    i) CMAA
    ii) Etc

4) Critical-vs.- Non-Critical Lifts

a) Definition
b) Documentation of Critical Lift determination
c) Specific hardware/equipment requirements
    i) Redundant brakes
    ii) Limit Switches – 2 upper and 1 lower
    iii) Some programs require no single order failures
    iv) Lifting hardware at Launch Facilities requires 200% test. Design accomplished with safety factor of 10. [Discuss not overloading, per OSHA]
d) Safety Hazard Analysis
e) Safety Observer
f) Specific lift procedures
g) How LDEM can improve program/project experience and avoid costly rework and schedule delays
h) Suspended Load Operations (Alternate Standard)
i) Relief from Requirements (Internal requirements only, except if Alternate Standard)

5) Types of Lifting Devices

a) Forklifts
    i) Examples
    ii) Safety features
    iii) Load charts
    iv) Cautions
b) Mobile Aerial Lifts
    i) Examples
    ii) Safety features
    iii) Load charts
    iv) Cautions
c) Mobile Cranes
    i) Examples
    ii) Safety features
        (1) LMI
        (2) Lockouts
        (3) Testing and load rating (tipping load) Show a tipping videos, preferably from an instrumented crane
    iii) Load Charts and how to read
        (1) Calculations and Deductions

iv) Typical failure modes
(1) Unstable footing (provide Video)
(2) Underground conditions
(3) Overhead power lines
(4) Two blocking (Provide Video)
v) Cautions and limitations

d) Overhead Cranes
i) Examples
ii) Safety features
(1) Bridge, trolley and hoist limit switches
iii) Load rating
iv) Typical failure modes
v) Cautions and limitations

e) Hoists and Winches
i) Examples
ii) Safety features
iii) Load capacity
iv) Cautions and limitations

f) Jacks supporting Flight Hardware
i) Examples
ii) Safety features
iii) Load capacity
iv) Cautions and limitations

6) Rigging Hardware

a) Detailed specific rigging training available and recommended
i) This module is not intended to provide detailed, thorough understanding of rigging practices and principles, but to provide top level general training and cautions

b) Types of hardware
c) Risk Management
d) Rigging plan
e) Loads on rigging and the rigging triangle
f) Application of hardware
i) Rated loads
ii) Design factors
iii) General rigging practices

g) Inspections/Load Tests of rigging hardware
i) Load testing of slings vs. other hardware
(1) OSHA Equivalent Entity
ii) Daily inspection before use (undocumented)
iii) Annual inspection documented

h) Application of Slings
i) Application of Shackles
j) Wire rope inspection
k) Sample rigging problems

7) Inspections / Load tests (provide typical examples of checklists for inspections)

a) Critical –vs- Non-Critical

i) Critical lift equipment requires an annual load test and inspection

b) Forklifts
   i) Daily/Monthly
   ii) Annual
   iii) Load testing cycle and amount
      (1) Proof load testing before initial use and after repair/modification

c) Mobile Aerial Lifts
   i) Daily/Monthly
   ii) Annual
   iii) Load testing cycle and amount

d) Mobile Cranes
   i) Daily/Monthly
   ii) Annual
   iii) Load testing cycle and amount

e) Overhead Cranes
   i) Daily/Monthly
   ii) Annual
   iii) Load testing cycle and amount

f) Hoists and Winches
   i) Daily/Monthly
   ii) Annual
   iii) Load testing cycle and amount

g) Jacks supporting Flight Hardware
   i) Daily/Monthly
   ii) Annual
   iii) Load testing cycle and amount

8) Operator Training and Certification

   a) Training Requirements
      i) OSHA
      ii) Industry
      iii) NASA
         (1) Classroom training
         (2) Written test
         (3) Hands on proficiency demonstration
         (4) Critical vs. Non-Critical

   b) Medical requirements
      i) Mobile Cranes
      ii) Overhead Cranes
         (1) Pendant
         (2) Cab or Pulpit
      iii) Forklifts
      iv) Aerial lifts

   c) Licenses
      i) Center specific – varies by center, may be a “card/license” or may be tracked in a Center’s data base that is readily accessible
      ii) If it doesn’t already exist, develop or adopt something that will work at your Center. Mention alternatives from other centers.
      iii) Length of Certification period

9) Lessons learned

   a) Best practices and not so best practices
      i) NASA
      ii) Industry
   b) Mishap investigations
      i) Several examples from NASA
   c) Mitigations – When you can't meet a requirement what are options
   d) Waivers
      i) OSHA requirements
      ii) NASA requirements
      iii) Center requirements
      iv) Industry/State requirements
   e) Typical Audit Findings
      i) Lifting Program management
         (1) LDEM lack of overall awareness/responsibility
         (2) No program or major gaps
      ii) Hardware
         (1) not all types in system
         (2) out of certification
         (3) damaged but in use
      iii) Training
         (1) Program
         (2) Operator
      iv) Critical lift designation
         (1) LDEM involvement
         (2) Documentation of results
      v) Critical lift hardware
      vi) Tracking/configuration control
      vii) Daily inspections
      viii) Wire rope inspections
      ix) Powered industrial truck attachments
   f) Initial LDEM training to be competent and continuing education (formal, informal, reading) to upgrade, enhance, and maintain capabilities is essential